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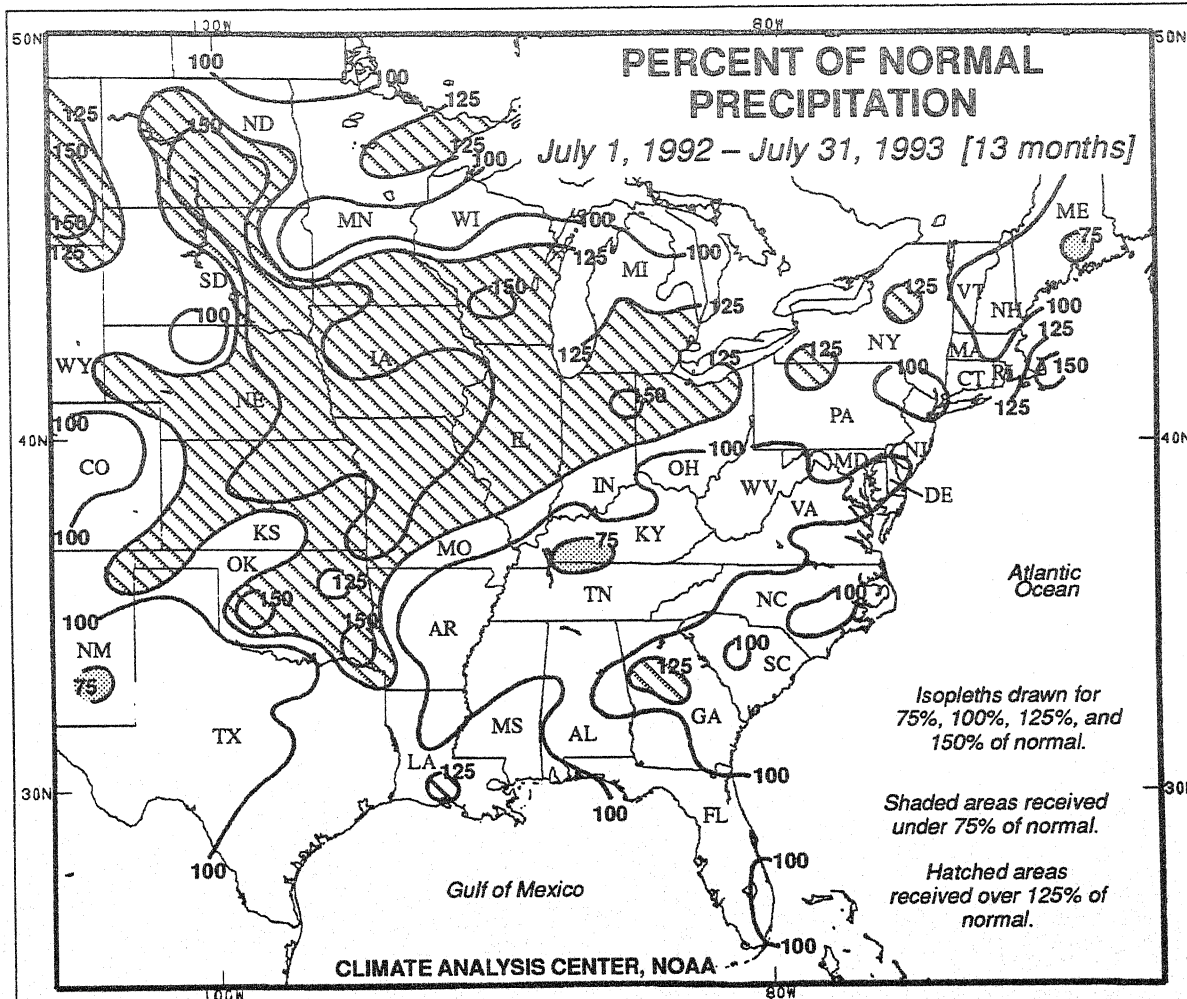
UPDATE ON
MIDWESTERN
FLOODS AND
SOUTHEASTERN
DROUGHT

WEEKLY CLIMATE BULLETIN

No. 93/31

Washington, DC

August 4, 1993



EXCEPTIONALLY LARGE LONG-TERM PRECIPITATION SURPLUSES OBSERVED ACROSS THE CENTRAL UNITED STATES. During the 13-month period of July 1, 1992 - July 31, 1993, large sections of the lower Great Lakes Region, the Midwest, the upper and middle Mississippi Valley, and the central and northern Great Plains received 125% - 200% of normal precipitation, which corresponds to 20 - 38 inches of accumulated surpluses in southeastern South Dakota, southeastern Iowa, eastern and central Kansas, western Missouri, and southern Oklahoma. Although a large portion of this excess (12 - 18 inches) was measured during the last four months, the ongoing long-term moisture surplus dating back to July 1992 combined with the large amounts of rain observed recently (up to 28 inches in the last two months) to generate the episode of unprecedented flooding afflicting the nation's midsection. For more details, refer to the Special Climate Summary on pages 5 - 7.



UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE-NATIONAL METEOROLOGICAL CENTER
CLIMATE ANALYSIS CENTER



WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- Highlights of major climatic events and anomalies.
- U.S. climatic conditions for the previous week.
- U.S. apparent temperatures (summer) or wind chill (winter).
- Global two-week temperature anomalies.
- Global four-week precipitation anomalies.
- Global monthly temperature and precipitation anomalies.
- Global three-month precipitation anomalies (once a month).
- Global three-month temperature anomalies (once a month).
- Global twelve-month precipitation anomalies (every three months).
- Global twelve-month temperature anomalies (every three months).
- Special climate summaries, explanations, etc. (as appropriate).

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

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GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF JULY 31, 1993

1. Northwestern United States:

ABNORMALLY COOL CONDITIONS CONTINUE.

Temperatures returned to near normal in southwestern Canada and across the southern Great Basin, but the remainder of the region again averaged cooler than normal, with weekly departures of -2°C to -5°C observed at most locations [5 weeks].

2. Central North America:

SEVERE FLOODING PERSISTS DESPITE DRIER WEEK.

Less than 25 mm of rain fell on South Dakota, most of Kansas, northeastern Nebraska, southwestern Iowa, and southern Missouri while 50–160 mm soaked scattered areas across northeastern North Dakota, Minnesota, central and eastern Iowa, central Nebraska, and east-central Kansas. Many areas received 305–430 mm of surplus rainfall during June and July, engendering continued serious river flooding throughout the region (see front cover and pages 5–7). In addition, heavy rains claimed their first Canadian casualty as flooding swept through portions of Winnipeg, Manitoba.

3. Southern United States:

THE DROUGHT CONTINUES.

Hot weather and little rain were again the rule across the Southeast, and a fourth successive week with little precipitation allowed large moisture deficits to spread through the northern lower Mississippi Valley and northeastern Texas. Most locations received less than 25 mm last week, although scattered totals of 50–125 mm were reported across central North Carolina, western South Carolina, and southern Georgia. Farther west, July 1993 was the first precipitation-free month at Dallas–Ft. Worth, TX in 90 years, with no rain reported at either of the cities' major airports [5 weeks]. Temperatures averaged 2°C to 4°C above normal at most locations in June and July, exacerbating the effects of the dry spell [4 weeks].

4. Central Mexico:

EXCESSIVE RAINFALL ABATES.

A few locations reported 50–90 mm of rain last week, but most areas received under 30 mm. Six-week rainfall surpluses, however, were in the 300–505 mm range at some places [Ending after 6 weeks].

5. Northeastern Argentina:

PRECIPITATION SHORTAGES DEVELOP.

Several locations across northeastern Argentina received under 25 mm of precipitation (representing less than 25% of normal) since late June [5 weeks].

6. Southern Africa:

SLIGHTLY COOLER CONDITIONS PREVAIL.

Unseasonably warm weather continued early in the week, with daily departures of up to 11°C reported on Sunday and Monday. As the week progressed, however, more seasonable weather was observed, generating weekly departures between $+2^{\circ}\text{C}$ and $+3^{\circ}\text{C}$ [4 weeks].

7. Northern India and Nepal:

INUNDATING RAINS AND FLOODING CONTINUE.

A few hundred millimeters of rain soaked much of western and northern India (including 520 mm at Ratnagiri), allowing moisture surpluses to remain high. In Nepal, reliable data are lacking, but press reports indicate that up to 535 mm fell on some locations, aggravating the severe flooding that has been plaguing the country. The nation's capital (Katmandu) was inaccessible by automobile for more than 11 days. The recent episode of severe flooding is Nepal's worst in 70 years, washing away 36 villages and taking as many as 12,000 lives, according to unofficial government sources. Farther south, drier weather engendered improving conditions through extreme eastern India and Bangladesh, but rivers remained dangerously high [7 weeks].

8. Southeastern China:

MORE WET WEATHER.

Most locations were dampened by 40–80 mm of rain, with isolated totals of 90–200 mm measured at several locations. According to press reports, flooding during the past few weeks claimed nearly 200 lives in Hunan and Sichuan provinces, injuring 8,000 individuals and destroying more than 270,000 dwellings. [15 weeks].

9. Eastern Mongolia and Northeastern China:

ABUNDANT PRECIPITATION CONTINUES.

Moderate rains (30–50 mm) fell on the eastern half of Mongolia while higher amounts (40–70 mm, with scattered totals of 100–250 mm) soaked northeastern China. Most of the region received more than twice the normal rainfall in the last six weeks [15 weeks].

10. Japan and South Korea:

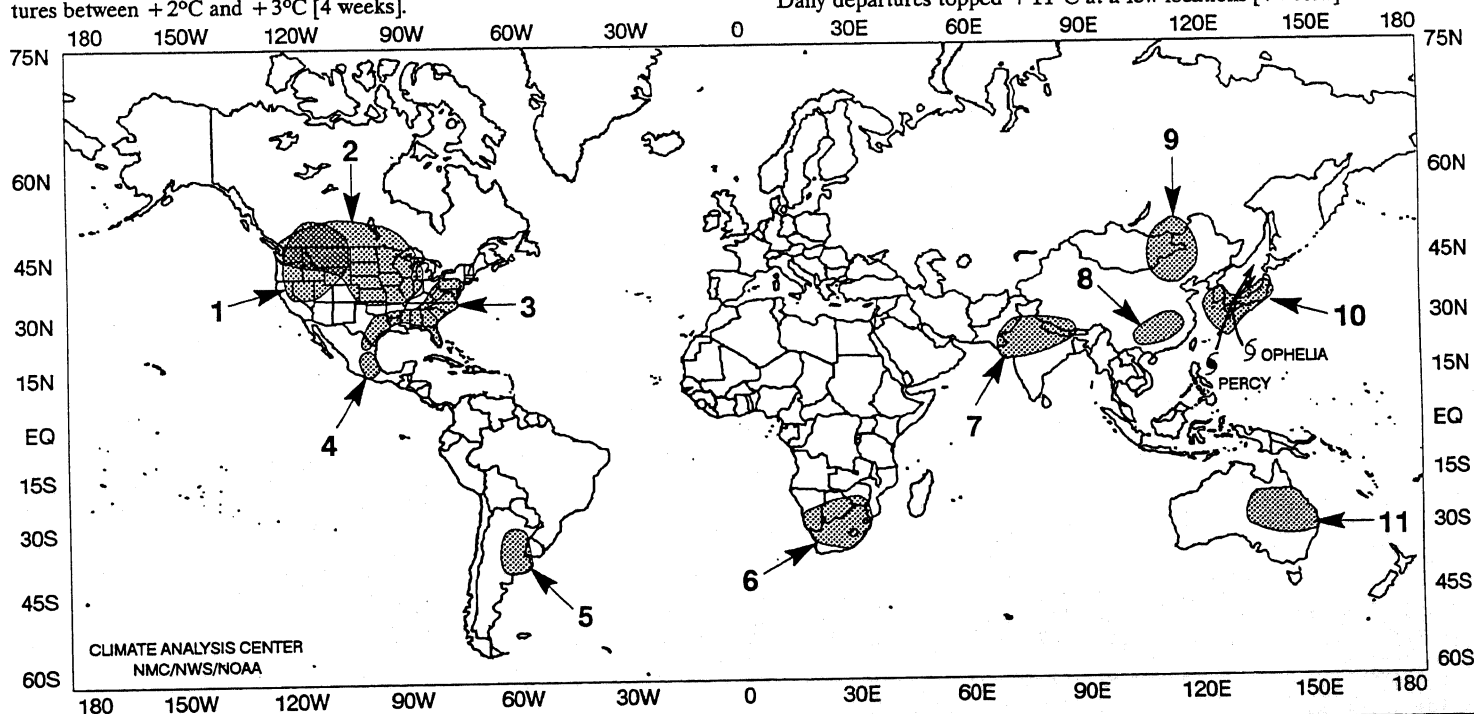
TWO TROPICAL SYSTEMS POUND REGION.

Within days of each other, minimal Typhoon Percy and Tropical Storm Ophelia tracked through southwestern Japan, generating up to 535 mm of rain in eastern Kyushu. In addition, heavy rains (100–210 mm) also fell on northern Honshu and parts of South Korea. According to press reports, landslides took over a dozen lives on Kyushu, where some locations received over 900 mm more rain than normal since mid-June (see page 8) [7 weeks].

11. Northeastern Australia:

REGION REMAINS UNSEASONABLY WARM.

Highs soared to 35°C as most areas averaged 3°C to 8°C warmer than normal. Daily departures topped $+11^{\circ}\text{C}$ at a few locations [4 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.
 MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF JULY 25 – 31, 1993

Scattered thunderstorms dumped up to five inches of rain on parts of the east-central Plains and middle Mississippi Valley, maintaining the record level flooding observed along the lower and middle Missouri and middle Mississippi Rivers. By week's end, the Mississippi rose to a record 49.4 feet at St. Louis, MO (nearly 19.5 feet above flood stage) while the Missouri reached 38.4 feet at St. Charles, MO. The raging waters, rising more quickly and higher than expected, wreaked havoc as they continued to overwhelm levees and force more evacuations. The Missouri River broke through a levee protecting Waldron, MO and pushed through another levee just west of St. Louis, MO, sending a wall of water into Chesterfield, MO and forcing the closure Interstate 64. The Illinois River washed over the Elred levee, protecting 10,500 acres of farmland, while the Mississippi spilled over an earthen levee in south St. Louis and knocked 51 propane tanks from their moorings, forcing the evacuation of 700 homes and businesses, according to press reports. Three bridges around St. Louis were closed late Friday while all Missouri River crossings (except the Interstate-70 bridge near Rocheport, MO) were shut down between St. Louis and Kansas City, MO. About 100,000 people in northwest Missouri remained without tap water while another 5,000 residents in Lexington, MO lost all water service when the flooding Missouri overwhelmed their water treatment plant.

Although abnormally hot weather continued through the Southeast, with weekly temperature departures of up to +7°F, scattered showers and thunderstorms (with up to four and a half inches of rain) brought limited relief to parts of the drought-plagued region for the second successive week. Hot and dry conditions, however, persisted over eastern Texas, where wildfires consumed over 7000 acres. Dallas-Fort Worth has not received rain since June 26, and July 1993 marked the cities first rain-free month in 90 years. Nine days of triple-digit temperatures also claimed the lives of four elderly women in the Dallas-Fort Worth area, according to press reports.

During the first part of the week, an eastward-moving frontal system generated widespread showers and thunderstorms from the central and northern Great Plains to the Atlantic coast. Locally heavy rain caused urban flooding in Fowler, MI and flooded the Little Minnesota, James, and Big Sioux Rivers in South Dakota and the Saline River in Kansas. Elsewhere, over two inches of rain in one hour doused Buena Vista, VA, and large hail pelted Lincolnton, NC. Hot conditions continued across the South, with daily record highs set from Arkansas to Georgia. In contrast, cool and wet weather persisted over the northern and central Rockies, with several daily record lows established. By mid-week, the frontal system moved into the Atlantic Ocean while a second system, which developed in the central and northern Plains, raced across the Ohio

Valley and Great Lakes, accompanied by more showers and thunderstorms. Nearly two dozen daily record highs were broken across the South and mid-Atlantic on Wednesday. Farther west, a Pacific cold front sped across the Northwest, spawning a few showers.

During the latter part of the week, the second front edged southeastward toward the Atlantic and Gulf coasts, generating scattered rain, with locally heavy amounts across the eastern third of the nation and the lower Mississippi Valley. Fierce thunderstorms raked northern Ohio along Lake Erie, killing two people and leaving more than 220,000 homes without power. Euclid, OH, a Cleveland suburb, was the hardest hit, with roofs ripped off buildings, trees uprooted, and cars smashed. Meanwhile, the Midwest got a respite from the persistent rains until the weekend, when a third frontal system developed and brought more rain into the upper and middle Mississippi Valley. At week's end, hot weather overspread California, with over a half dozen new daily record highs set as temperatures topped the century mark.

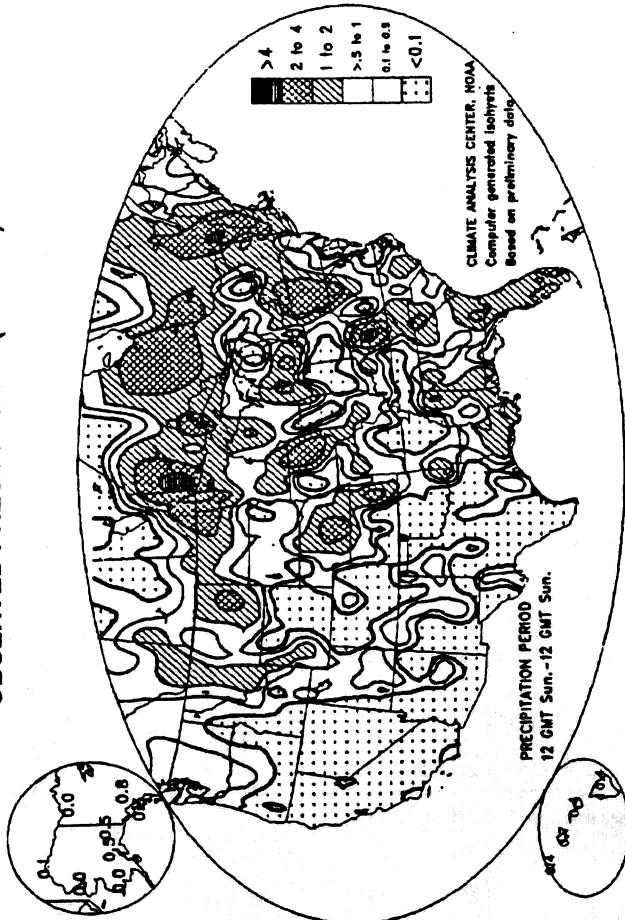
According to the River Forecast Centers, the greatest weekly rainfall totals (from two to seven inches) fell across central Nebraska, eastern Iowa, the Red River Valley of North Dakota and Minnesota, southern Michigan, eastern Kentucky, western New England, and from eastern West Virginia northward to southwestern New York. Scattered totals of two or more inches were reported across the Southeast, the northern Rockies, eastern Hawaii, and the remainders of the northern and central Plains, Mississippi Valley, Great Lakes, and Appalachians. Light to moderate amounts were observed in the Northwest, the southern High Plains, southeastern Alaska, and the remainders of Hawaii, the Rockies, the northern and central Plains, and the eastern half of the nation. Little or no precipitation fell on the southeastern Plains, the Great Basin, the desert Southwest, California, and northern and central Alaska.

Warmer than normal conditions in the contiguous United States prevailed from the southern Rockies northeastward to the Great Lakes and western New England and eastward to the middle and southern Atlantic coast and along the central California coast. Departures of +4°F to +7°F reached from the southern High Plains to the middle and southern Atlantic coast and along the central California coast. Abnormally warm conditions also persisted in Alaska, with departures of up to +5°F observed across the south-central portions of the state.

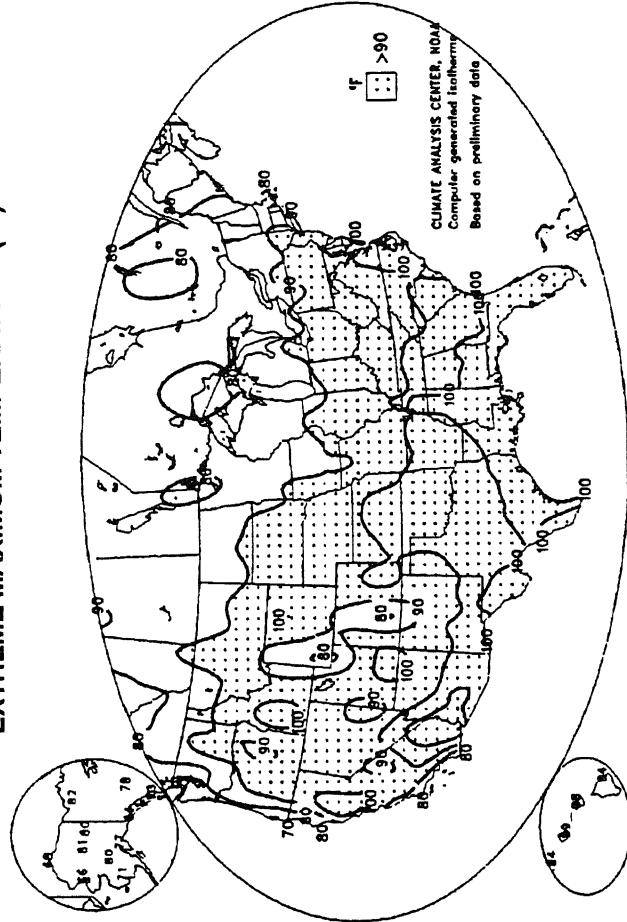
In contrast, unseasonably cool weather continued to dominate from the Pacific coast eastward to the middle Mississippi Valley and the Red River Valley of Minnesota and the Dakotas as well as through much of New England. Weekly departures from -5°F to -10°F extended from the interior Northwest eastward to the northern High Plains. Temperatures averaged near normal over Hawaii.

UNITED STATES WEEKLY CLIMATE CONDITIONS (July 25 – 31, 1993)

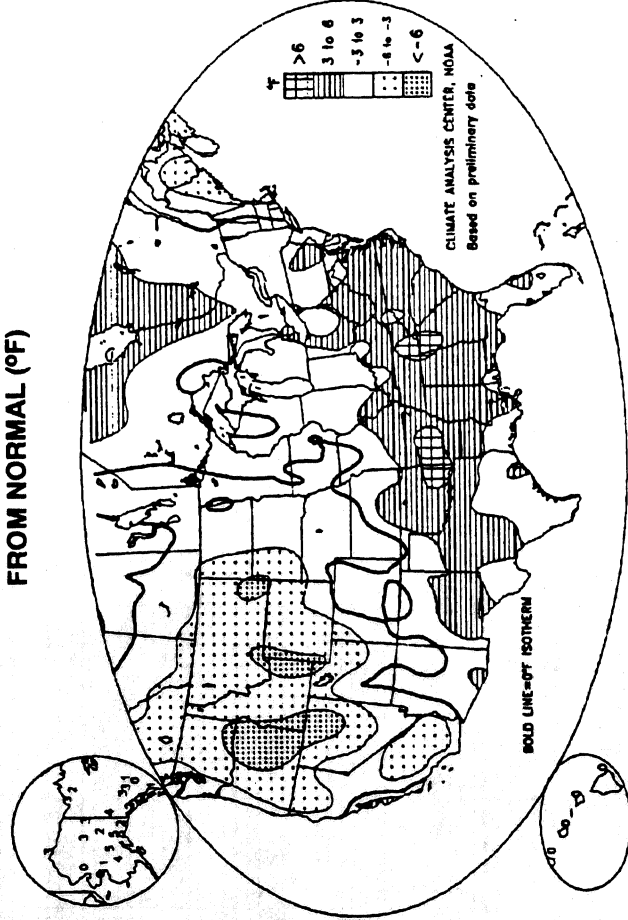
OBSERVED PRECIPITATION (INCHES)



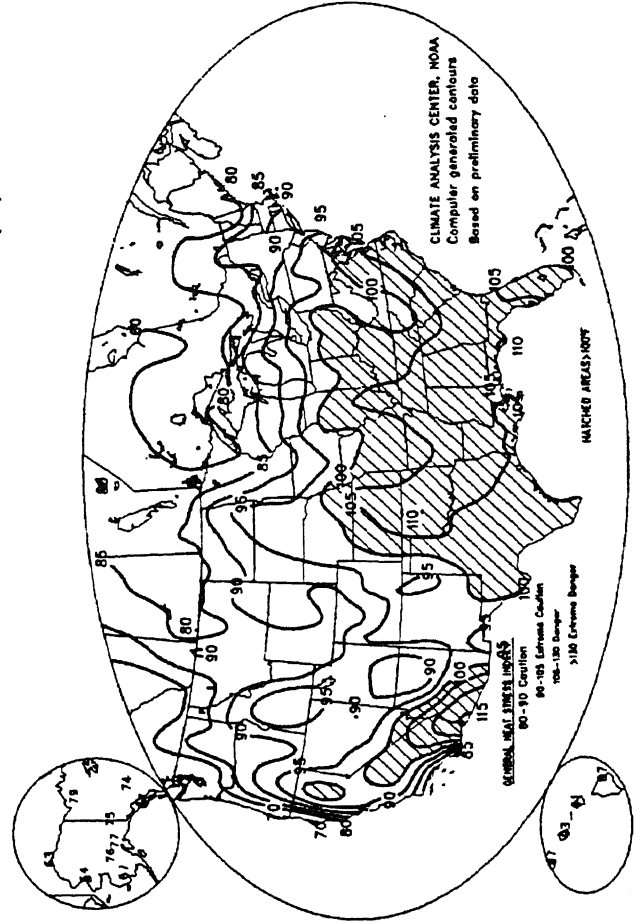
EXTREME MAXIMUM TEMPERATURE (°F)



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

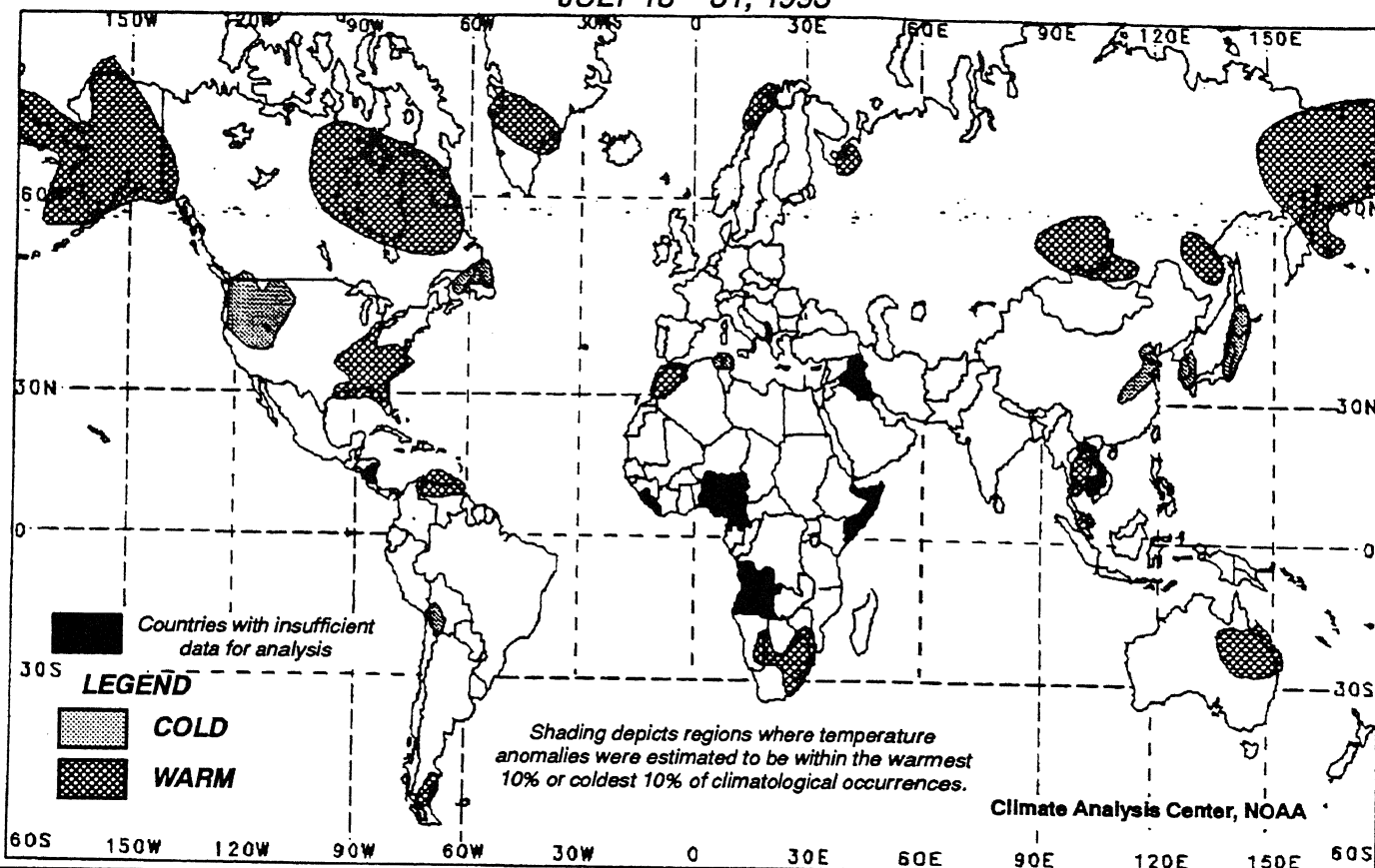


EXTREME APPARENT TEMPERATURE (°F)



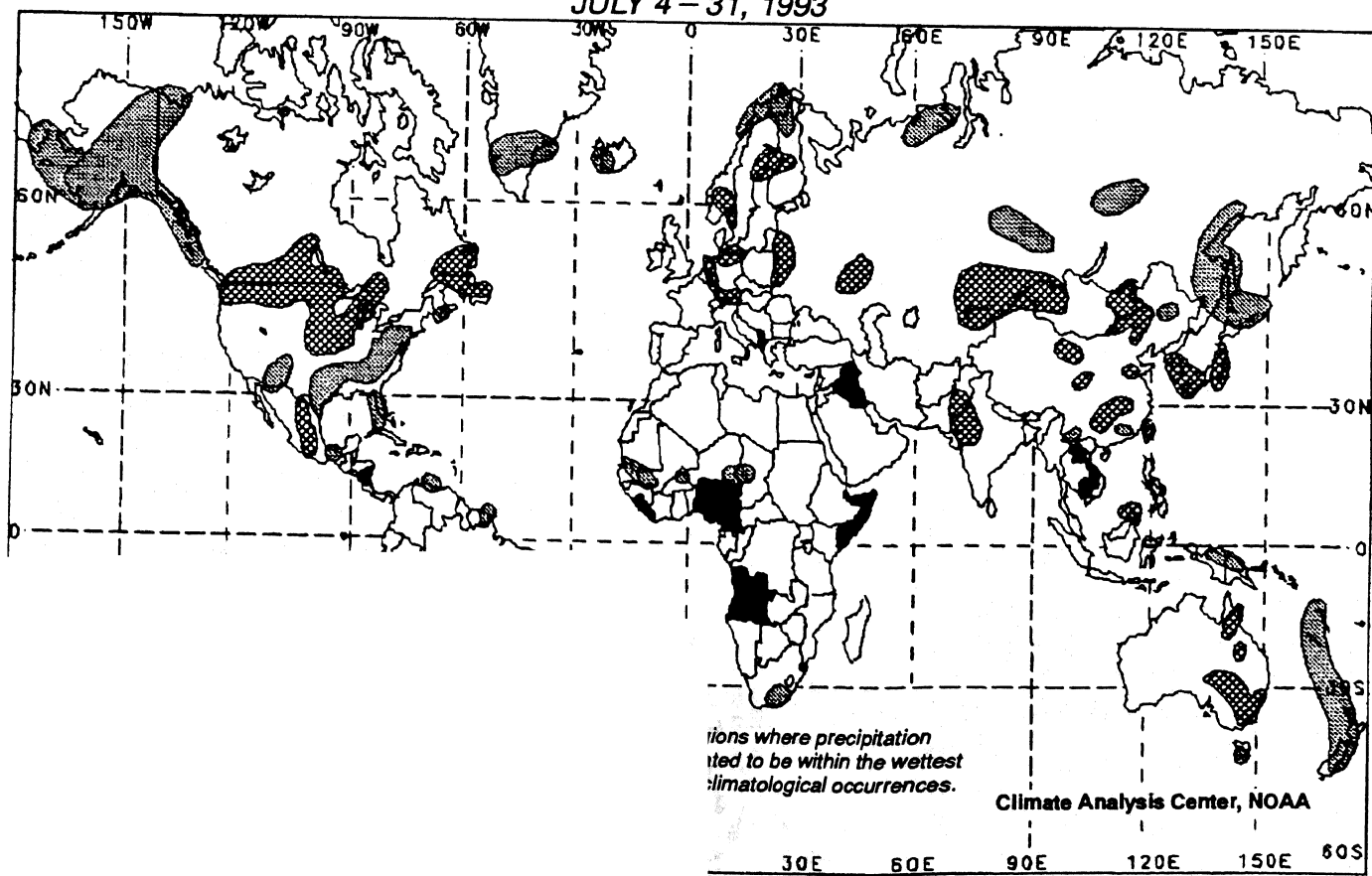
TWO-WEEK GLOBAL TEMPERATURE ANOMALIES

JULY 18 – 31, 1993



FOUR-WEEK GLOBAL PRECIPITATION ANOMALIES

JULY 4 – 31, 1993



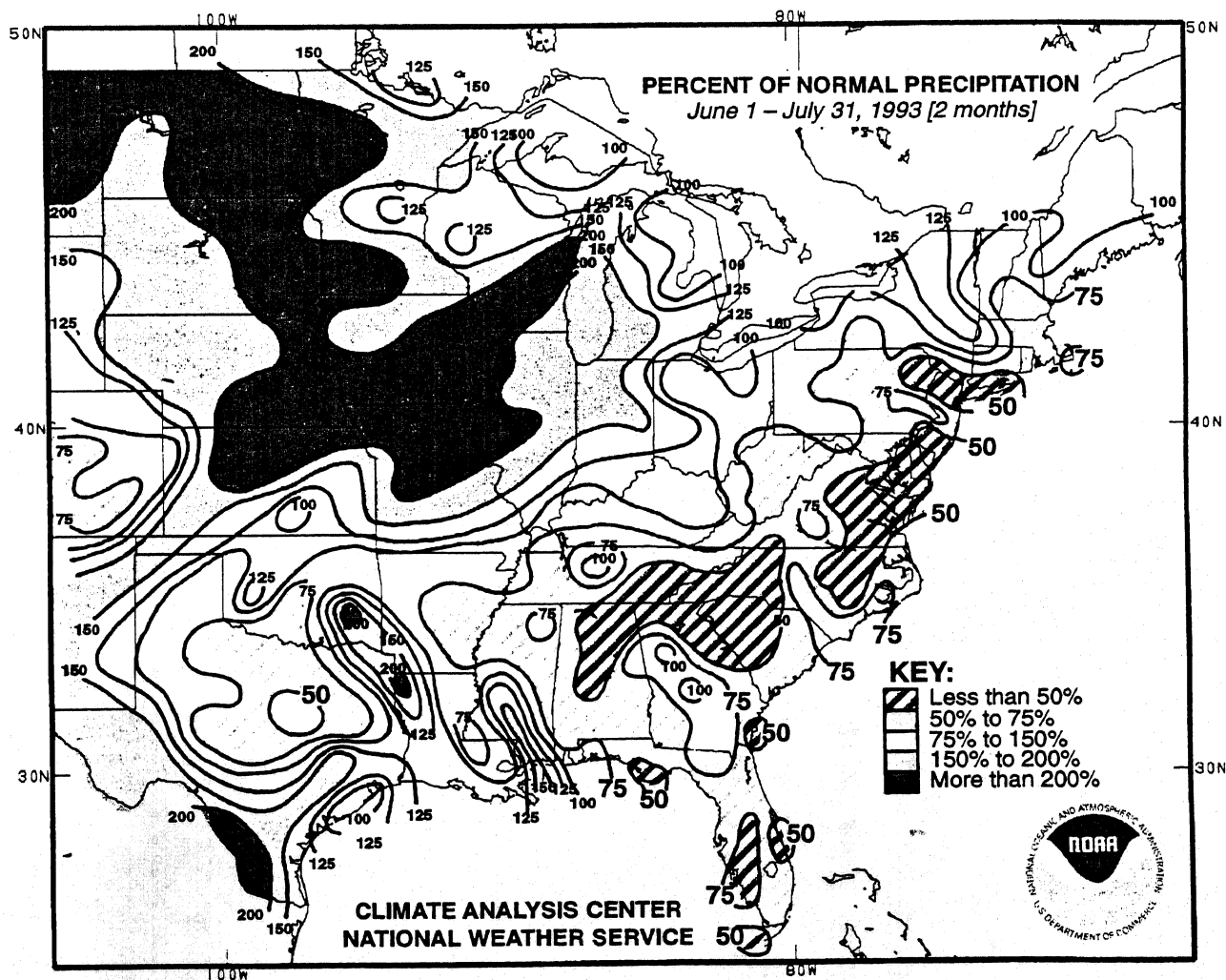
SPECIAL CLIMATE SUMMARY

Analysis and Information Branch
Climate Analysis Center, NMC
National Weather Service, NOAA

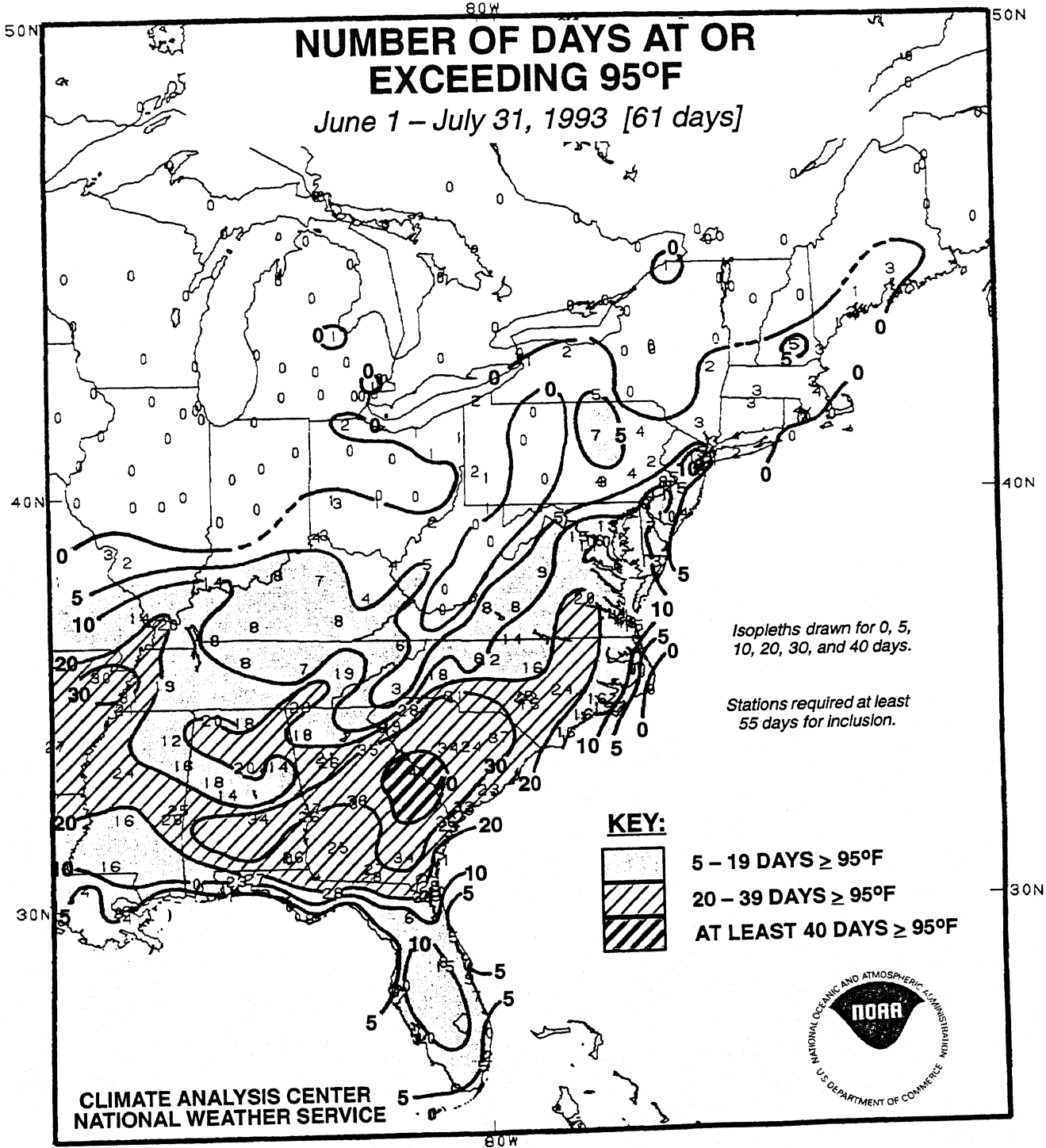
UPDATE ON MIDWESTERN FLOODING AND SOUTHEASTERN DROUGHT

During the last two weeks (since our last update), conditions across the Midwest continued to deteriorate. Another large meso convective complex swept through the Midwest on the last day of July, pushing two-month (June – July) rainfall totals to over two inches in portions of southern and eastern Iowa, north-central Missouri, and central and north-central Kansas. Amounts were more than twice the normal through portions of the southwestern Great Lakes, middle Mississippi Valley, and central and northern Great Plains (see figure below). Since the beginning of the growing season (April 1), rainfall totals have been measured in feet rather than inches throughout the central and north-central U.S., with over three feet of rain falling on parts of central and eastern Kansas. At some locations, notably Cedar Rapids, IA and Salina, KS, the observed 1993 April – July totals (34.44" and 37.22", respectively) exceeded the normal ANNUAL precipitation (33.72" and 29.82").

The severe impacts of the resultant flooding through the Mississippi/Missouri Drainage Basin have been well documented. Losses across the eight most severely affected states (IL, IA, MN, MO, WI, NE, KS, and SD) exceed \$11 billion, according to press reports. Forty-seven lives were lost, and tens of thousands of citizens have been displaced. Over 16,000 sq. mi. (10.2 million acres) of land is not typically underwater has been flooded. The Mississippi River has been closed to traffic from St. Paul, MN southward to Cairo, IL (585 miles) since June 25, and the Missouri River was similarly closed from the Mississippi River confluence to near Sioux Falls, SD (535 miles) since late June. Only 20 of the 275 Federal levees across the Midwest have been breached or overtopped, but nearly all of the 1091 non-Federal levees failed. Large sections of the populations of Des Moines, IA, St. Joseph, MO, Alton, IL, and Lexington, MO were without potable tap water for at least a week. Record high river levels were observed along the Mississippi River from St. Louis, MO to Chester, IL, along the final 531 miles of the Missouri River prior to the Mississippi confluence, and at numerous locations along many of the Rivers' tributaries, including the Kansas River in Kansas City, MO and the Racoon and Iowa Rivers in Des Moines, IA (a summary of impacts is depicted on page 7).



While extensive flooding and inundating rains plague the Midwest, abnormally hot weather and well below normal rainfall engendered incipient drought conditions through much of the southern and eastern U.S. Subnormal precipitation dates back to the beginning of the growing season through much of South Carolina, but only the last 2 – 3 months in most other areas. During June and July, less than half of normal rainfall was measured on Long Island and in the greater New York City area, from southern New Jersey southwestward into southeastern North Carolina, and from western North Carolina southward into central Alabama, including northern Georgia and the northwestern half of South Carolina. Unusually warm weather was also observed during much of this period, especially in the interior Southeast. Temperatures observed through the two-month period averaged at least 4°F above normal across portions of northern Georgia, western South Carolina, and eastern Tennessee, where most non-mountain stations reported 20–47 days (out of 61) reaching 95°F or higher. At Augusta, GA, where 47 of the 61 days reached or exceeded 95°F, only about 37 days typically reach or exceed 90°F. Fortunately, the recent dryness followed a prolonged period of above normal precipitation for most locations, minimizing the effects of the drought on hydrological concerns and streamflows, but the timing of the dryness, which began near or shortly after the nominal beginning of the growing season, has had a deleterious effect on the region's agriculture. As of August 1, 100% of the topsoil moisture in Maryland, Virginia, and Delaware is short or very short, as is 98% in Virginia, 87% in North Carolina, 96% in South Carolina, 91% in Georgia, and 95% in Tennessee. All of the corn in South Carolina and Delaware is rated poor or very poor, and none of the corn in Maryland is rated higher than fair. In addition, 100% of the pastures in Pennsylvania, New Jersey, Maryland, Delaware, and South Carolina are in poor condition (for more information on crop conditions across the nation, please contact the Joint Agricultural Weather Facility (202) 720-7917.)

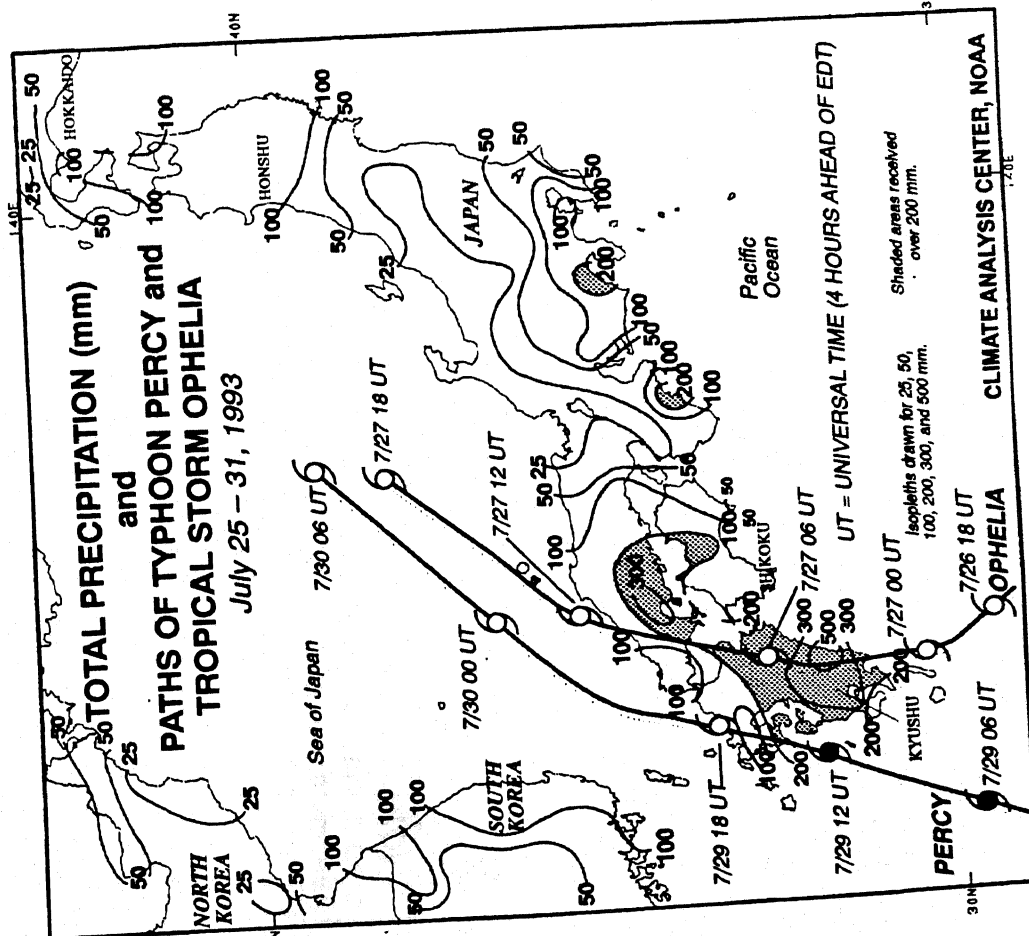
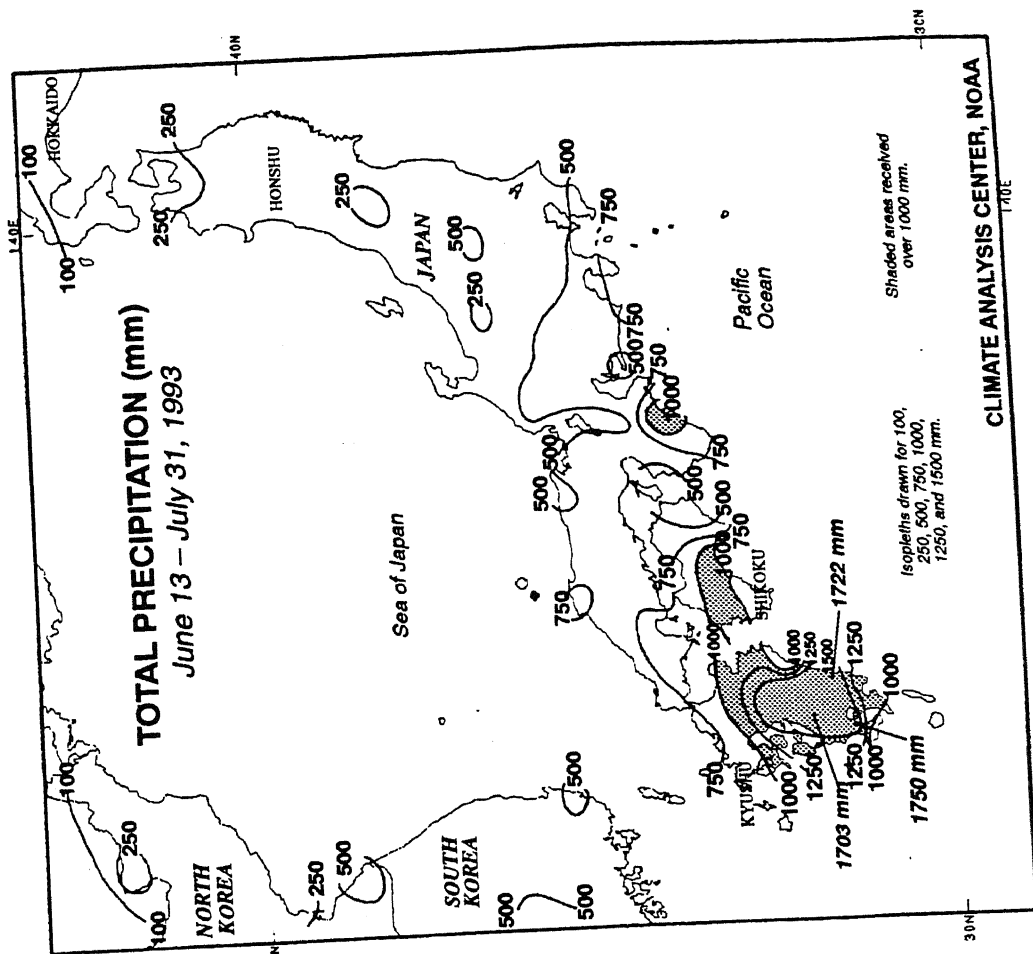


June / July / Early August 1993



SPECIAL CLIMATE SUMMARY

Analysis and Information Branch
Climate Analysis Center, NMC
National Weather Service, NOAA



TWO TROPICAL SYSTEMS GENERATE HEAVY RAINS ACROSS ALREADY-SATURATED SOUTHWESTERN JAPAN. Tropical Storm *Ophelia* tracked north-northeastward through eastern Kyushu and extreme southwestern Honshu during 7/27, accompanied by heavy rains and gusty winds. Two days later, Typhoon Percy followed a track slightly west of the one *Ophelia* took, traversing western Kyushu and dropping more heavy rains on the already-saturated island. According to press reports, landslides resulting from the systems' heavy rains (weekly totals exceeded 500 mm on southeastern Kyushu) took over a dozen lives. These rains were particularly problematic because they fell on a region that had already been inundated during the previous five weeks. From mid-June through the end of July (49 days), between 1500 and 1730 mm of rain deluged Kyushu, an average of up to 35 mm per day. In addition, abnormally heavy amounts were also observed through

